Product Brief

Intel® 5100 Memory Controller Hub Chipset

Embedded Computing

Intel® 5100 Memory Controller Hub Chipset for Embedded Computing

Supporting Quad-Core Intel® Xeon® Processor 5400/5300 Series and Dual-Core Intel® Xeon® Processor 5200/5100 Series

Product Overview

The power-optimized Intel® 5100 Memory Controller Hub (MCH) chipset supports development with high-performance, low-power Intel® multi-core processors, allowing bladed and dense bladed system designs to fit within a maximum 200-watt power envelope. Platform power savings is derived from lower thermal design power (TDP) in the MCH, a low-power Intel® I/O Controller Hub 9R (Intel® ICH9R), and standard native DDR2 memory technology.

When combined with the energy-efficient technology of Intel® 45nm quad-core and dual-core processors, this platform delivers compelling performance-per-watt advantages for thermally constrained applications in communications, storage, and embedded market segments. It is ideal for a wide range of applications, such as storage area networks (SANs), network attached storage (NAS), routers, IP-PBX, converged/unified communications platforms, content firewalls, unified threat management (UTM) systems, medical imaging equipment, military signal and image processing, and telecommunications (wireless and wireline) servers – particularly in AdvancedTCA.*

The Intel 5100 MCH chipset supports leading quad-core and dual-core Intel® Xeon® processors in single- and dual-processor configurations, ranging from 1.6 GHz to 2.66 GHz core speed, with 35W to 65W TDPs. This unique processor mix provides customers excellent scalability across multiple TDPs when designing for thermally constrained applications.

Product Highlights

Memory

High-performance DDR2 registered ECC memory, operating at 533 or 667 MHz, helps safeguard data and improve reliability. Configurable for single- or dual-independent channel operation, the Intel 5100 MCH chipset supports x4 or x8 DDR2 memory technology, utilizing 512 MB, 1 GB, and 2 GB devices for up to six ranks per channel and a maximum capacity of 48 GB. The high memory capacity provides customers the flexibility needed to optimize platform memory configurations.

PCI Express* and I/O Connectivity

PCI Express (PCIe) provides essential bandwidth necessary to support quad-core and dual-core Intel Xeon processors. A PCIe x1 link delivers bi-directional peak bandwidth of 500 MB/s, while x4, x8, and x16 links provide 2 GB/s, 4 GB/s, and 8 GB/s respectively. The MCH supports six x4 PCIe links. Platform designers may combine

Product Highlights (continued)

each x4 link into three x8 links or one x16 link for configuration flexibility. In addition, the Intel ICH9R PCIe has six x1 lanes that can be combined into one x4 and two x1 links, or six x1 links. The ICH9R includes six independent Serial ATA controllers (each capable of up to 3 GB/s transfer rate), an integrated Gigabit Ethernet MAC, and 12 USB* ports with dual EHCI.

Memory Reliability, Accessibility and Serviceability (RAS) Features

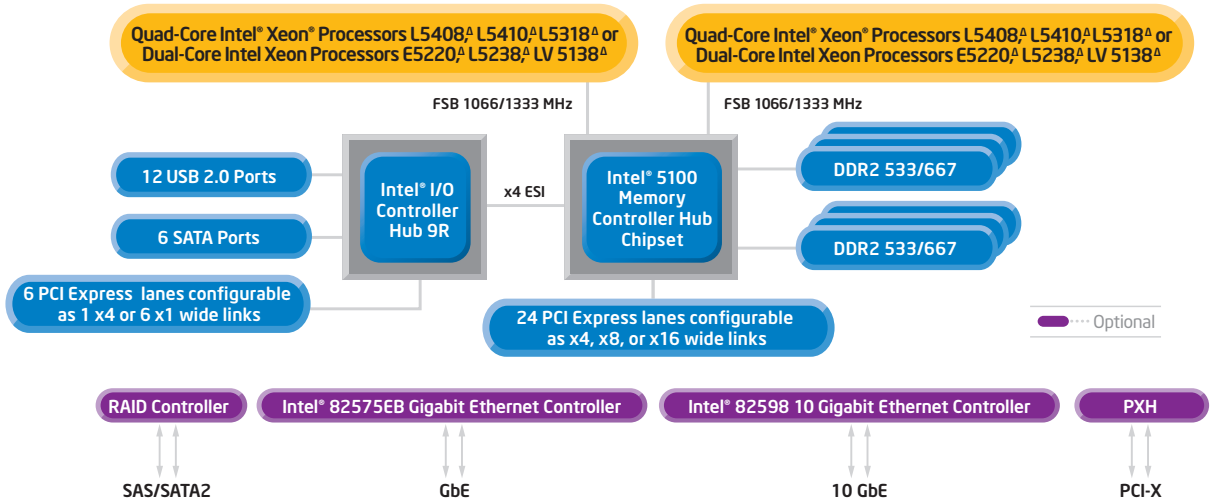
- **Demand and patrol scrubbing** proactively searches system memory, repairing correctable errors for enhanced system reliability.
- **Optional memory sparing** swaps "defective" DIMMs with installed but otherwise unused DIMMs for improved availability.
- **x4 Single Device Data Correction (SDDC)** can repair a failed x4 DRAM device on-the-fly, utilizing advanced ECC capabilities. This allows system operation to continue until the defective device is replaced.
- **Error correcting code** corrects single-bit and detects double-bit errors. Automatically corrects single-bit errors on internal data paths, boosting system reliability and availability.

Advanced Platform Features

- **Integrated, industry-leading RAID capability** (RAID 0, 1, 5 and 10) delivers performance and protection via Intel® Matrix Storage Technology.[1]
- **Front side bus address, data, and command parity** increase system reliability and availability.
- **BIOS boot from both the Firmware Hub and/or SPI Flash** provides increased BIOS capacity and user flexibility, supporting both legacy and UEFI BIOS.[2]

Advanced Intel® Platform Technologies

Intel® Virtualization Technology,[3] a processor hardware enhancement, assists virtualization software to deliver more efficient virtualization solutions and greater capabilities, including 64-bit guest OS support. Intel® I/O Acceleration Technology[4] (Intel® I/OAT) moves network data more efficiently through Intel Xeon processor-based platforms, improving network performance by significantly reducing CPU overhead and freeing resources for more critical tasks.



Lower Platform Power Plus Higher Performance Delivers Improved Performance/Watt

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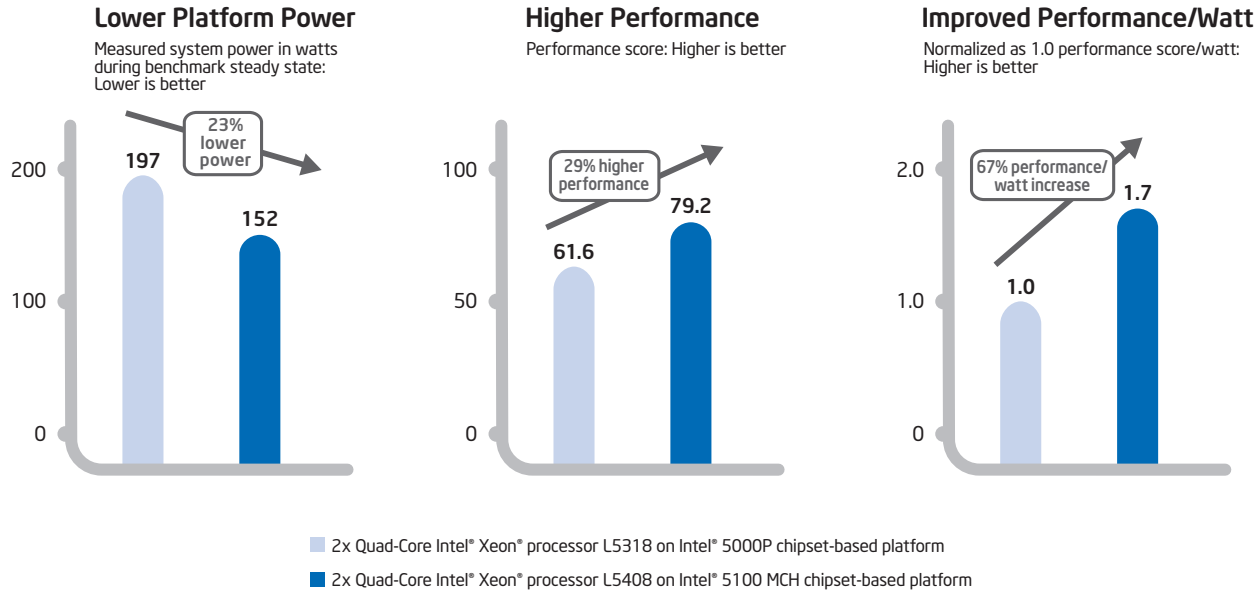

Benchmark Tests Demonstrate Compelling Performance-Per-Watt Increase

Benchmarks shown above compare system performance of two platforms – the 65nm Quad-Core Intel Xeon processor with Intel® 5000P chipset and the 45nm Quad-Core Intel Xeon processor with Intel 5100 MCH chipset. Both platforms are in dual-processing configurations (eight cores per system). Results for the Intel 5100 MCH chipset-based platform show a 67% increase in compute performance-per-watt, 29% increase in platform performance, and 23% decrease in platform power, resulting primarily from lower TDP in the MCH and ICH9R along with native DDR2 memory technology. Additional performance-per-watt advantages are derived from the energy-efficient technology of the 45nm quad-core processor. The 67% performance-per-watt increase makes the Intel 5100 MCH chipset-based platform ideal for bladed and dense bladed applications needing to fit within a maximum 200-watt power envelope.

Benchmark Configuration Details

- Performance comparison of 2x Quad-Core Intel® Xeon® processor L5318 on an Intel 5000P chipset-based platform versus 2x Quad-Core Intel Xeon processor L5408 on an Intel 5100 MCH chipset-based platform using the same workloads. Actual performance may vary. Source: SPECint_rate_base2006* (score) benchmarks are Intel internal measured results as of January 2008.

Configurations:

- Configuration #1: Processor: Quad-Core Intel® Xeon® processor L5318, 1.6 GHz, 8 MB L2 Cache, 1067 MHz FSB. Platform: Intel® Server Board S5000PSLSATAR Reference Board, Intel 5000P chipset, 4x2 GB FBD-667 Dual Rank. Software: SuSE 10.1 RC 5 32bit Linux, 2.6.16.46-0.12-smp kernel, CPU2006 V1.0 benchmark suite, Intel ICC10.1 compiler, American Megatrends Inc BIOS 84.
- Configuration #2: Processor: Quad-Core Intel® Xeon® processor L5408, 2.13 GHz, 12 MB L2 Cache, 1067 MHz FSB. Platform: Quad-Core Intel® Xeon® processor 5000 sequence and Intel® 5100 MCH chipset development kit; Intel 5100 MCH chipset. 4x2 GB DDR2-667 Dual Rank. Software: Red Hat Enterprise Linux 4 Update 2, 2.6.9-22.ELsmp kernel, CPU2006 V1.0 benchmark suite, Intel ICC10.1 compiler, American Megatrends Inc BIOS 80014.
- Benchmark Description for SPECcpu*2006 suite (SPECint*_rate_base2006): SPEC CPU2006 is the industry adopted, CPU-intensive benchmark which stresses the system processor(s), memory subsystem, and compiler. Derived from 29 real user applications, CPU2006 provides a comparison across the widest practical range of hardware reporting a geometric mean ratio score on a baseline compiled binary.
- SPEC benchmark tests results for Intel® microprocessors are determined using particular, well-configured systems. These results may or may not reflect the relative performance of Intel microprocessors in systems with different hardware or software designs or configurations (including compilers). Buyers should consult other sources of information, including system benchmarks, to evaluate the performance of systems they are considering purchasing. Additional information for CPU2006 can be found at www.spec.org. Performance tests and ratings are measured using specific computer systems and/or components and reflect the approximate performance of Intel products as measured by those tests. Any difference in system hardware or software design or configuration may affect actual performance. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering for purchase. For more information on performance tests and on the performance of Intel products, visit http://www.intel.com/performance/resources/benchmark_limitations.htm.

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Product	Product Code	Package	Feature
Intel® 5100 Memory Controller Hub (MCH) chipset	QG5100MCH	1432 Flip Chip-Ball Grid Array (FC-BGA)	25.7 watts TDP at 1333 MHz FSB; 23.0 watts TDP at 1066 MHz FSB; 19.5 watts TDP at 1066 MHz FSB *(single processor configuration and one memory channel)*
Intel® I/O Controller Hub 9R (Intel® ICH9R)	NH82801IR	676 mBGA	3.4 to 4.3 watts TDP depending on configuration

Intel in Embedded and Communications: intel.com/go/embedded

[Δ] Intel® processor numbers are not a measure of performance. Processor numbers differentiate features within each processor series, not across different processor sequences. See http://www.intel.com/products/processor_number for details.

[1] Required Intel® RAID Technology Option ROM.

[2] UEFI provided by third-party Independent BIOS Vendors (IBVs).

[3] Intel® Virtualization Technology requires a computer system with an enabled Intel® processor, BIOS, virtual machine monitor (VMM) and, for some uses, certain platform software enabled for it. Functionality, performance or other benefits will vary depending on hardware and software configurations and may require a BIOS update. Software applications may not be compatible with all operating systems. Please check with your application vendor.

[4] Intel® I/O Acceleration Technology requires an operating system that supports Intel® I/OAT.

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